

<b>BROOKHAVEN NATIONAL LABORATORY</b> Safety & Health Services Division  <b>INDUSTRIAL HYGIENE GROUP</b> Standard Operating Procedure	NUMBER <b>IH51660</b>
	REVISION <b>FINAL rev 4</b>
SUBJECT: Program Procedure  <b>Instrument Calibration and Maintenance Program</b>	DATE <b>12/13/04</b>
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<b>CALIBRATED</b>	
By: _____	Date: _____
Due: _____	

## 1.0 Purpose & Scope

This document describes the SHSD Industrial Hygiene Group (IHG) *Calibration and Maintenance Schedule policy* for direct reading instrument and air sampling pumps. Its purpose is to establish IHG policy on the frequency and mechanism for calibration and repair of IHG instrumentation.

The goal of the procedure is to provide a uniform protocol for preserving IHG instrumentation in a manner that will result in accurate, precise, and reliable readings from the instruments.

Procedures for maintenance and/or calibration of individual pieces of equipment are documented in separate SOPs within the IHG's written documentation.

## 2.0 Responsibilities

- 2.1 **Program Administration:** This procedure is administered through the SHSD Industrial Hygiene Group. Members of the SHSD Industrial Hygiene Group are required to follow this procedure.

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### **3.0 Definitions**

- 3.1 **Program Administrator:** A person designated by the IH Group Leader to administer this procedure and associated sampling equipment management.
- 3.2 **Equipment Custodian:** A person designated by the IH Group Leader or Program Administrator to process equipment for maintenance and calibration in accordance with this procedure.

### **4.0 Prerequisites**

None

### **5.0 Precautions**

- 5.1 **Personal Protective Equipment:** The use of personal protective equipment to protect personnel handling IHG instrumentation during preparation for calibration and maintenance is not typically required.

If it is necessary to handle equipment with potential surface contamination, at a minimum, disposable gloves must be used when contacting the exposed surfaces. Do all handling of contaminated equipment within a laboratory hood.

- 5.2 **Radiological Contamination:** It is possible that some equipment may have been taken into areas with radiological contamination. The IHG person handling equipment must verify from RCD that the equipment has been analyzed for the radiological hazard and are at radiological contamination levels below the permissible release limits to the general public.

### **6.0 Procedure**

- 6.1 **Equipment:** Calibration Labels, from BNL PPM Stock or equivalent. See Section 6.5 for wording.

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- 6.2 **Determining the frequency of calibration.** Refer to *Attachment 9.1* to this procedure for a list of IHG instrumentation and the IHG determined calibration frequency. Calibrations are to be completed within the frequency listed in *Attachment 9.1* or the equipment must be removed from service.
- 6.3 **Establishing the Frequency of calibration.** The calibration frequency listed in *Attachment 9.1* is determined by the Program Administrator based on the following hierarchy of references (based on DOE O 414.1A):
- 6.3.1 Manufacturer's recommendation as stated in the instruments *Operation Manual* or *Owner's Instruction Manual*.
  - 6.3.2 Manufacturer's recommendation as stated in other means of communication with BNL, such as memorandum, e-mails, or documented phone conversations.
  - 6.3.3 Other engineering/scientific standards specifically referring to a particular type of instrumentation.
  - 6.3.4 IHG determination of calibration needs based on experience with the equipment or recommendations by other sources.
- 6.4 **Calibration Procedures:** This SOP does not provide specific calibration procedure methodology. Follow IH Group written procedures specific to instruments that IHG performs calibrations "in-house" for the methodology for calibration.
- 6.5 **Documenting Calibration Status:** The on-going calibration status of each IHG electronic instrument (other than sampling pumps) must be marked on the meter by means of a label on the meter. The label must, at a minimum, indicate that the meter is "calibrated" and show the date of expiration.
- 6.5.1 For meters calibrated by vendors, a label may have been placed on the meter. IHG will add any of the following missing information on an auxiliary label: company name performing calibration, date of calibration, and expiration or due date.
  - 6.5.2 The sticker used by IHG for "in-house" calibration must contain at least the following wording:

<b>CALIBRATED</b>	
BY_____	DATE_____
DUE_____	

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- 6.5.3 For equipment that is out of service and has expired on the acceptable calibration interval, but is being held in reserve as a potential replacement, a label with the following wording shall be prominently placed on the equipment:



- 6.5.4 Log the date of calibration in the IHG Intellitrack® database.

6.6 **Maintenance of Instruments:** The IHG policy on routine maintenance for equipment:

- 6.6.1 Sampling Pumps: Repair and routine replacement of expendable parts such as diaphragms and batteries shall be done as needed when instruments fail to calibrate or fails operate within required parameters.
- 6.6.2 Meters and Instruments:
- 6.6.2.1 Off-site Calibration- Meters receive routine maintenance during their periodic calibration by off-site vendors.
- 6.6.2.2 On-site Calibration- Meters calibrated by IHG will receive maintenance or repair if they fail to calibrate within specifications or fail to operate within typical parameters.
- 6.6.3 Damage or abuse: When IHG meters show signs of damage or abuse they will be repaired by IHG or the manufacturer as needed.

## **7.0 Implementation and Training**

- 7.1 **Qualification Criteria:** Only individuals who have demonstrated knowledge of this procedure to the satisfaction of the IH Group Leader, the Program Administrator, or their designee will be qualified to perform any activities described in this procedure. The qualification criteria to conduct work following this procedure are:

- 7.1.1 Specific knowledge of this procedure shown by an ability to answer questions on procedure.

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- 7.1.2 Personnel shall be re-qualified at a frequency not to exceed three years.
- 7.1.3 If significant and substantive changes to the procedure are made, all qualified *Equipment Custodians* will be notified of the changes.
- 7.1.4 Personnel performing maintenance on energized electrical meters or pumps in a condition that potentially exposes them to the energy source (meets definitions of “hot work”) must meet all BNL training and medical approval requirements.

## **8.0 References**

- 8.1 DOE Order 414.1A.
- 8.2 Numerous manufacturers’ operation manuals were reviewed in the creation of Attachment 9.1. References to manufacturers are included in Attachment 9.1.

## **9.0 Attachments**

- 9.1 **Attachment 9.1:** BNL Instrument Calibration Frequency Policy

The only official copy is on-line at the SHSD IH Group website.  
Before using a printed copy, verify that it is current by checking the document issue date on the website.

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## 10.0 Documentation

Document Review Tracking Sheet		
<b>PREPARED BY:</b> <i>(signature and date on file)</i> <b>R. Selvey</b> <i>(signature and date on file)</i> <b>D. Wadman</b> <b>Date: 02/14/01</b>	<b>REVIEWED BY:</b> <i>(signature and date on file)</i> <b>R. Wilson</b> <i>(signature and date on file)</i> <b>J. Peters</b> <b>Date: 02/15/01</b>	<b>APPROVED BY:</b> <i>(signature and date on file)</i> <b>R. Selvey</b> <b>IH Group Leader</b>  <b>Date: 03/07/01</b>
<b>Filing Code:</b>  <b>IH52QR.01</b>	<b>DQAR</b> <b>Date</b>	<b>Effective Date:</b>  <b>03/18/03</b>

**Note: Updating of Attachment 8.1 on an “as-needed basis” does not require re-approval of this procedure.**

Periodic Review Record		
Date of Review	Reviewer Signature and Date	Comments Attached
04/24/01	<i>(Signature and date on file)</i> R. Selvey	Renumbered from IH60660 to 51660 to correct clerical mistake.
01/29/02	<i>(Signature and date on file)</i> R. Selvey	Revised Table to add new instruments and revise policy on some meters
03/17/03	<i>(Signature and date on file)</i> R. Selvey	Revised Section 7 and Attachment 9.1 to add new instruments and revise policy on some meters. Added “IHG” changes to policy.
12/13/04	<i>(Signature and date on file)</i> R. Selvey	Revised Attachment 9.1 to add new instruments and revise policy on some meters.

**I. Air Sampling Equipment**

<b>Meter</b>	<b>Manufacturer &amp;Address/Phone</b>	<b>Manufacturer Calibration Frequency Recommendation</b>	<b>BNL Calibration Frequency Policy</b>	<b>BNL Calibration Mechanism</b>
<b>SKC Low Flow Pump</b>  Model: <b>SKC 222-3</b>	SKC	Recommendation Reference:  Operation Manual Manual Date: Page:	<b>Prior to and after each use</b>	BY IHG via - DryCal - Soap Film Flow Meter
<b>SKC High Flow Pump</b>  Model: <b>SKC 224-43XR</b> <b>SKC 224-44XR</b>	GAST	Recommendation Reference:  Operation Manual Manual Date: Page:	<b>Prior to and after each use</b>	BY IHG via - DryCal - Soap Film Flow Meter - Singer Dry Test Meter
<b>GAST High Flow Pump</b>  Model: <b>GAST</b>	GAST	Recommendation Reference:  Operation Manual Manual Date: Page:	<b>Prior to and after each use</b>	BY IHG via - DryCal - Dry Test meter
<b>Dry Cal Calibrator</b>  Model: BIOS DC-1	Bios International Corp. 230 W. Parkway Unit 1 Pompton Plains, NJ 07444 800-663-4977	Recommendation Reference: <b>No recalibration required</b>  Operation Manual Manual Date: 2/5/97 Page: section 2.0	<b>None</b>	IHG with Soap Film Flow Meter multipoint calibration or Off-site Vendor
<b>Dry Cal Calibrator</b>  Model: BIOS DC-2	Bios International Corp. 230 W. Parkway Unit 1 Pompton Plains, NJ 07444 800-663-4977	Recommendation Reference: <b>No recalibration required</b>  Operation Manual Manual Date: Page: section	<b>Annual</b>	IHG with Soap Film Flow Meter multipoint calibration or Off-site Vendor
<b>Singer Dry Test Meter</b>  Model:	American	Recommendation Reference:  Operation Manual Manual Date: Page:	<b>Prior to use if over one year from calibration</b>	IHG with Soap Film Flow Meter multipoint calibration or Off-site Vendor

**I. Air Sampling (Continued)**

<b>Meter</b>	<b>Manufacturer &amp;Address/Phone</b>	<b>Manufacturer Calibration Frequency Recommendation</b>	<b>BNL Calibration Frequency Policy</b>	<b>BNL Calibration Mechanism</b>
<b>VelociCalc Air Velocity Meters</b>  Models: <b>8355/8357 and 8360</b>	TSI Incorporated ATT: Customer Service 500 Cardigan Road Shoreview, MN 55126 Phone: (612) 483-4711 (800) 876-9874 FAX: (612) 490-2874	Recommendation Reference: <b>Annual</b>  Operation Manual Manual Date: 2/92 Page: 32	<b>Annual</b>	RCD IC wind tunnel or Offsite vendor
<b>Alnor Swinging Vane Anemometer</b>  Models: 6000P	Alnor 7555 N. Linden Ave. Skokie, IL 60097 312-677-3500	Recommendation Reference: <b>Not required</b>  Operation Manual Manual Date: 11/77 6270 Page: 13	<b>None</b> Calibration only after damage.	If needed due to damage: RCD IC wind tunnel or Offsite vendor
<b>Alnor Compuflo Air Velocity Meter</b>  Models: 8500D-11	Alnor 7555 N. Linden Ave. Skokie, IL 60097 312-677-3500	Recommendation Reference: <b>No recommendation stated</b>  Operation Manual Manual Date: 1984 Page: 13	<b>Out of service</b> , held as back-up for TSI anemometers, if used Annual	RCD IC wind tunnel or Offsite vendor



**II. Chemical Analyzers**

<b>Meter</b>	<b>Manufacturer &amp;Address/Phone</b>	<b>Manufacturer Calibration Frequency Recommendation</b>	<b>BNL Calibration Frequency Policy</b>	<b>BNL Calibration Mechanism</b>
<b>Jerome Mercury Vapor Analyzer</b>  Model: <b>Jerome 431-X</b>	Arizona Instrument 4114 East Wood Street Phoenix, AZ 85040-1941 (602) 470-1414 (800) 235-3360 FAX: (602) 470-1888	Recommendation Reference: <b>Annually</b>  Operation Manual Manual Date: July, 1996 Page: 12	<b>Annual</b>	Offsite Vendor
<b>Bacharach Sentinel Personal Gas Monitor</b>  Model: <b>Sentinel 44T &amp; 44</b>	Bacharach 625 Alpha Drive Pittsburgh, PA 15238-2878 Phone: (412) 963-2000	Recommendation Reference: <b>As per user set intervals</b>  Operation Manual Manual Date: 5/95, Rev. 2 Pages: 5-9 & 8-2	<b>Annual (minimum), target goal is Quarterly</b>	IHG single point calibration with standard gas for each sensor
			<b>Before each use</b>	IHG bump check with gas for each sensor to be measured in field.
<b>Scott Scout Multi-Gas Personal Monitor</b>	Tyco: Scott Technologies Inc. Scott Instruments 251 Welsh Pool road Exton PA 19341  610-363-5450	Recommendation Reference: <b>As per user set intervals</b> Before each use, test sensors using a known concentration of calibration gas to verify within 10% of actual gas concentration. Operation Manual #087-0019 Manual Date: March 2003 Pages: 23 - 26	<b>Annual (minimum), target goal is Quarterly</b>	IHG single point calibration with standard gas for each sensor
			<b>Before each use</b>	IHG bump check with gas for each sensor to be measured in field.
<b>Ozone- UV Photometric Ozone Analyzer</b>  Model: <b>1008-PC</b>	Dasibi Environmental Corp. 506 Paula Ave. Glendale, Calif. 91201	Recommendation Reference: <b>No recommendation stated</b> Operation Manual Manual Date: 1990 Page: 6-1, 6-11	<b>3 years</b>	Factory or off-site vendor calibration, maintenance, and check of internal generation source lamp
			<b>Annual</b>	IHG multiple point calibration with internal ozone generation source
<b>TSI Q-track IAQ monitor</b>	TSI Incorporated ATT: Customer Service 500 Cardigan Road Shoreview, MN 55126 Phone: (612) 483-4711 (800) 876-9874 FAX: (612) 490-2874	Recommendation Reference: <b>Annually</b>  Operation Manual Manual Date: Feb 2001 Page: 35	<b>Annual</b>	Factory or off-site vendor calibration, maintenance, and check of internal generation source lamp

**IH51660 Attachment 9.1 BNL Instrument Calibration Frequency Policy**

Date: 12/13/2004 (4)

Meter	Manufacturer &Address/Phone	Manufacturer Calibration Frequency Recommendation	BNL Calibration Frequency Policy	BNL Calibration Mechanism
<b>RAM Real-Time Aerosol Monitor</b>  Model: RAM-1	GCA/Environmental Instruments Burlington Road Bedford, MA 01730 Phone: (617) 275-5900	Recommendation Reference: <b>No Recommendation stated</b>  Operation Manual Manual Date: 9/79 Page:	<b>Annual</b>	Off-site vendor
<b>Mini-RAM Aerosol Monitor</b>  Model: PDM-3	MIE/GCA/Environmental Instruments 213 Burlington Road Bedford, MA 01730 Phone: (617) 275-5444	Recommendation Reference: <b>No Recommendation stated</b>  Operation Manual Manual Date: March 1990 Sections 1.4, 8.0, 12.0	<b>Prior to use for OEL compliance measurements, meter must have a zero offset is less than 3 mg/m<sup>3</sup>. If not factory calibration or PDM-RS calibration is required.</b>	Off-site vendor or BNL use of a Reference Scatterer (MIE model PDM-RS)
<b>FAM Fibrous Aerosol Monitor</b>  Model: FAM-1	GCA/Environmental Instruments Burlington Road Bedford, MA 01730 Phone: (617) 275-5900	Recommendation Reference: <b>500 hrs or 1 year</b>  Operation Manual Manual Date: 8/88 Page: 25	<b>Annual</b>	Off-site vendor
<b>NUCON Aerosol Detector</b>  Model: Model F	Nuclear Consulting Services, Inc. 7000 Huntley Road Columbus, Ohio 43229-1035 Phone: (614) 846-5710 FAX: (614) 431-0858	Recommendation Reference: <b>Field Calibration Checks for Normal Use</b>  Operation Manual Manual Date: 11/90 Rev. 1 Page: 5	<b>Annual</b>	Off-site vendor
<b>NITON XRF Spectrum Analyzer</b>  Model: 300 & 700 Series	NITON Service 610 Ten Rod Road North Kingstown, RI 02852 Voice: (401) 294-1234 FAX: (401) 295-2090 Email: support@niton.com	Recommendation Reference: <b>Every 24 months</b>  Operation Manual Manual Date: 1998 Page: Page 1-12	<b>2 year or each source change which is less</b>	Off-site vendor or manufacturer
			<b>Prior to and after each use</b>	IHG check of field reference standards

**IH51660 Attachment 9.1 BNL Instrument Calibration Frequency Policy**
**Date: 12/13/2004 (5)**

<b>Meter</b>	<b>Manufacturer &amp;Address/Phone</b>	<b>Manufacturer Calibration Frequency Recommendation</b>	<b>BNL Calibration Frequency Policy</b>	<b>BNL Calibration Mechanism</b>
<b>Sapphire Infrared Analyzer</b>  <b>Model: Miran 205B</b>	Thermo Environmental Instruments 8 West Forge Parkway Franklin MA 02038	Recommendation Reference: <b>Factory Calibration on initial shipment, user performed calibration built internal into meter.</b> Page 99 provides method for user calibration. Additional info MI-611-035  Operation Manual Manual Date: 3/99 Page: 48 and 99	<b>Qualitative analysis</b> use only (non OEL) – <b>prior to each use</b>	IHG bump test with any chemical in instrument inventory
			<b>Quantitative Analysis</b> for OEL compliance- <b>Annual</b>	IHG calibration for compound of interest using closed loop
			<b>3 year cycle</b>	Send to Offsite Vendor for maintenance and calibration with single gas
<b>TVA-1000 PID/FID Analyzer</b>  <b>Model: TVA-1000</b>	Foxboro Thermo Environmental Instruments 8 West Forge Parkway Franklin MA 02038	Recommendation Reference: <b>Beginning of each workday w/ calibration gas</b>  Operation Manual Manual Date: 8/31/93 Page:25	<b>Qualitative analysis</b> use only (non OEL) – <b>prior to each use</b>	IHG bump test with chemical(s) in question
			<b>Quantitative Analysis</b> for OEL compliance- <b>Each day of use</b>	IHG calibration for compound of interest using cal gas standard or closed loop
			<b>3 year cycle</b>	Send to Offsite Vendor for maintenance and calibration with single gas
<b>Voyager Gas Chromatograph</b>  <b>Model: Voyager</b>	PE Photovac 761 Main avenue Norwalk CT 06859 203-761-5330	Recommendation Reference: <b>Start of each day and at 8 hours using calibration gas standard</b>  Operation Manual Manual Date: 12/97 Page: 59 & 9	<b>Qualitative analysis</b> use only (non OEL) – <b>prior to each use</b>	IHG bump test with any detectable chemical
			<b>Quantitative Analysis for OEL compliance- Annual</b>	IHG via single point calibration with cylinder standard
<b>Mettler Toledo Balance AG245</b>	Mettler Toledo, Inc. PO Box 71 Hightstown, NJ 08520-0071 609-448-3000	Recommendation Reference: Internal weight test. Do at start up and after every location change and at regular interval (not specified) Operation Manual Manual Date: 1995 Page:13	<b>Annual</b>	IHG test with internal weight, if it cannot be electronically set, vendor service call will be made.

**IH51660 Attachment 9.1 BNL Instrument Calibration Frequency Policy**

Date: 12/13/2004 (6)

Meter	Manufacturer &Address/Phone	Manufacturer Calibration Frequency Recommendation	BNL Calibration Frequency Policy	BNL Calibration Mechanism
<b>Mettler Toledo Balance PB3002</b>	Mettler Toledo, Inc. PO Box 71 Hightstown, NJ 08520-0071 609-448-3000	Recommendation Reference: Internal weight test. Do at start up and after every location change and at regular interval (not specified) Operation Manual Manual Date: no date Page: 8	<b>Annual</b>	IHG test with internal weight, if it cannot be electronically set, vendor service call will be made.
<b>CAHN Micro Balance</b>	Cahn 16207 S. Carmenita Rd. Cerritos, CA 90701 213-926-3378	Recommendation Reference: <b>Each time power is lost</b>  Operation Manual Manual Date: no date Page:6	<b>Out of service, Calibrate prior to use and Each time power is lost &amp; Annual</b>	IHG test with two Cahn calibration sources, if out of calibration so that it cannot be electronically set, vendor service call will be made.
<b>H-Nu PID Photo-ionization Detector</b>  Model: <b>PI-101</b> 10.2 eV & 11.0 eV	HNu Systems Inc.	Recommendation Reference: <b>Frequency not specified</b>  Operation Manual Manual Date: 1975 Page: 19	<b>Out of Service</b> Meter to be held out-of-service as replacement for TVA-1000, will require calibration before use and then on 1 year cycle	IHG via single point calibration with isobutylene standard
<b>Chlorine- Compact Portable Analyzer 4000 Series</b>  Model: <b>4340SP Chlorine</b>	Interscan Corporation PO Box 2496 Chatsworth, CA 91313-2496 Phone: (800) 458-6153	Recommendation Reference: <b>Dependent on use, and sensor sensitivity</b> Operation Manual Manual Date: 1991 Page: <b>3-3</b>	<b>Out of Service</b>	Offsite Vendor
<b>K&amp;D IAQ Indoor Air Quality Monitor</b>  Model: <b>KD451</b>	K.D. Engineering Unit 34 4291 Meridian Street Bellingham, Washington 98226 Phone: (800) 308-7717 FAX: (800) 739-4497 Email: info@teamkd.com	Recommendation Reference: <b>No recommendation stated</b>  Operation Manual Manual Date: <b>July, 1999</b> Page: 10	<b>Out of service, if repaired, calibration only as needed, meter is not used for OEL measurements</b>	Off-site vendor or manufacturer maintenance and calibration of sensors
			<b>Out of service, prior to use and then Annual</b>	IHG calibration via single point calibration for CO and CO2

**III. Non-ionizing Radiation Meters**

<b>Meter</b>	<b>Manufacturer &amp;Address/Phone</b>	<b>Manufacturer Calibration Frequency Recommendation</b>	<b>BNL Calibration Frequency Policy</b>	<b>BNL Calibration Mechanism</b>
<b>Holaday Clamp On Induced Current Meter</b>  Model: <b>HI-3702</b>	Holaday Industries, Inc. 14825 Martin Drive Eden Prairie, Minnesota 55344 Phone: (612) 934-4920 FAX: (612) 934-3604 Email: <a href="mailto:Sales@holadyinc.com">Sales@holadyinc.com</a>	Recommendation Reference: <b>Yearly</b>  Operation Manual Manual Date: 1/98 Page: 14	<b>Annual</b>	Off-site vendor
<b>Holaday VDT Radiation Survey Meter</b>  Model: <b>HI-3600 VLF</b> <b>HI-3600-02 ELF</b>	Holaday Industries, Inc. 14825 Martin Drive Eden Prairie, Minnesota 55344 Phone: (612) 934-4920 FAX: (612) 934-3604 Email: <a href="mailto:Sales@holadyinc.com">Sales@holadyinc.com</a>	Recommendation Reference: <b>No Recommendation stated</b>  Operation Manual Manual Date: <b>08/89</b> Page:	<b>Out of Service for OEL compliance monitoring</b> Can be used for qualitative detection of fields, but not quantifying field strength without Annual calibration <b>Annual Factory calibration is required for OEL compliance monitoring</b>	Off-site vendor
<b>Holaday Magnetic Field Monitor/Dosimeter</b>  Model: <b>HI-3550</b>	Holaday Industries, Inc. 14825 Martin Drive Eden Prairie, Minnesota 55344 Phone: (612) 934-4920 FAX: (612) 934-3604 Email: <a href="mailto:Sales@holadyinc.com">Sales@holadyinc.com</a>	Recommendation Reference: <b>Annual</b>  Operation Manual Manual Date: 11/93 Pages: 10 & 11	<b>Annual</b>	Off-site vendor
<b>Holaday Microwave Oven Meter</b>  Model: <b>1501</b>	Holaday Industries, Inc. 14825 Martin Drive Eden Prairie, Minnesota 55344 Phone: (612) 934-4920 FAX: (612) 934-3604 Email: <a href="mailto:Sales@holadyinc.com">Sales@holadyinc.com</a>	Recommendation Reference: <b>12 months</b>  Operation Manual Manual Date: 2/90 Page: 9	<b>Annual</b>	Off-site vendor
	Holaday Industries, Inc. 14825 Martin Drive	Recommendation Reference: <b>Annual</b>	<b>Annual</b>	Off-site vendor

# IHS1660 Attachment 9.1 BNL Instrument Calibration Frequency Policy

Date: 12/13/2004 (8)

Meter	Manufacturer &Address/Phone	Manufacturer Calibration Frequency Recommendation	BNL Calibration Frequency Policy	BNL Calibration Mechanism
<b>Holaday 3-Axis ELF Magnetic Field Meter</b>  Model: <b>3627</b>	Eden Prairie, Minnesota 55344 Phone: (612) 934-4920 FAX: (612) 934-3604 Email: <a href="mailto:Sales@holadyinc.com">Sales@holadyinc.com</a>	Operation Manual Manual Date: 6/92 Page: 20		
<b>Narda Electromagnetic Radiation Survey Meter (yellow case)</b>  Model: <b>8718B</b>	Narda 435 Moreland Road Hauppauge, NY 11778 Phone (631) 231-2700 FAX: (631) 231-1711 Email: <a href="mailto:nardaeast@L-3com.com">nardaeast@L-3com.com</a>	Recommendation Reference: <b>Every 2 years</b>  Operation Manual Manual Date: 2/2000 Pages: 129	<b>2 year</b>	Off-site vendor
<b>Walker Static Magnetic Field Meter</b>  Model: <b>FGM-3D1</b>	Quality Assurance Product Group Rockdale Street Worcester, MA 01606 Phone: (508) 852-3674 FAX: (508) 856-9931	Recommendation Reference: <b>No Recommendation stated</b>  Operation Manual Manual Date: no date Page: 21	<b>None-</b> no OEL compliance use allowed without calibration	Meter NOT to be used for OEL compliance monitoring (meter range is too sensitive for use without cancellation of earth's magnetic field, source must removed or shut off to zero meter)
<b>Metrolab THM 7025 Magnetic Field Meter</b>	GMW Associates PO Box 2578 Redwood City, CA 94064 651-802-8292 www.gmw.com	Recommendation Reference: <b>Annual</b>  Operation Manual- none Calibration Certificate dated 4/17/01	<b>Annual</b>	Off-site vendor
<b>International Light Visible Light Meter Radiometer/Photometer</b>  Model: <b>IL1400A</b>	International Light, Inc. 17 Graf Road Newburyport, MA 01950-4092 Phone: (508) 465-5923 FAX: (508) 462-0759	Recommendation Reference: <b>No frequency recommendation.</b> Factory pre-sale Cal is by electronic means and manual implies that no re-calibration is needed. Operation Manual Manual Date: Rev. 920210 Page: 27	No calibration required for qualitative check use  No OEL compliance use without annual calibration	Off-site vendor
<b>International Light UV Actinic Radiometer</b>  Model: <b>IL 530</b>	International Light, Inc. 17 Graf Road Newburyport, MA 01950-4092 Phone: (508) 465-5923 FAX: (508) 462-0759	Recommendation Reference:  Operation Manual Manual Date: Page:	<b>Out of service</b>  No OEL compliance use allowed without calibration	Off-site vendor

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Meter	Manufacturer &Address/Phone	Manufacturer Calibration Frequency Recommendation	BNL Calibration Frequency Policy	BNL Calibration Mechanism
<b>International Light Research Radiometer</b>  Model: <b>IL 700A</b>	International Light, Inc. 17 Graf Road Newburyport, MA 01950-4092 Phone: (508) 465-5923 FAX: (508) 462-0759	Recommendation Reference:  Operation Manual Manual Date: Page:	<b>Out of service</b>  No OEL compliance use allowed without calibration	Off-site vendor
<b>Extech Light Meter</b>	Extech Instruments (781) 890-7440 www.extech.com	Recommendation Reference: None  Operation Manual Manual Date: 8808-59-102 Page:	<b>Out of service</b>  No OEL compliance use allowed without calibration	Off-site vendor
<b>Narda Broadband Isotropic Radiation Monitor</b>  Model: <b>8306b/ 8616</b>	Narda 435 Moreland Road Hauppauge, NY 11778 Phone (631) 231-2700 FAX: (631) 231-1711 Email: <a href="mailto:nardaeast@L-3com.com">nardaeast@L-3com.com</a>	Recommendation Reference: <b>No recommendation stated</b>  Operation Manual Manual Date: <b>11/76</b> Pages: 4: 6-14 Narda Calibration Service User's Guide 12 months	<b>Out of Service-</b> Meter to be held out-of-service as replacement for Narda 8718B, will require calibration before use and then on 2 year cycle	Out of Service
<b>FW Bell Hand-held Gauss/Tesla Meter</b>  Model: <b>Model 4048</b>	F.W. Bell 6120 Hanging Moss Road Orlando, FL 32807 Phone: (407) 678-6900	Recommendation Reference: <b>No Recommendation stated</b>  Operation Manual Manual Date: 881001 TD 360686 Page: entire manual reviewed	<b>Out of service,</b> If used: Annual	Off-site vendor or IHG check to NIST standard source
<b>Narda Microwave Oven Survey Meter</b>  Model: <b>8110</b>	Narda 435 Moreland Road Hauppauge, NY 11778 Phone (631) 231-2700 FAX: (631) 231-1711 Email: <a href="mailto:nardaeast@L-3com.com">nardaeast@L-3com.com</a>	Recommendation Reference: <b>No recommendation stated</b> Operation Manual Manual Date: <b>7/70</b> Pages:  Narda Calibration Service User's Guide <b>12 months</b>	<b>Out of Service-</b> Meter held out-of-service as replacement for Holaday 1501, will require calibration before use and then on 2 year cycle	Out of Service

## IV. Other Meters &amp; Equipment

Meter	Manufacturer &Address/Phone	Manufacturer Calibration Frequency Recommendation	BNL Calibration Frequency Policy	BNL Calibration Mechanism
<b>Questemp 15</b>  Model: <b>Area Heat Stress Monitor</b>	Quest Technologies 510 Worthington Street Oconomowoc, WI 53066 Phone: (414) 567-9157 Phone: (800) 245-0779 FAX (414) 567-4047	Recommendation Reference: <b>No Recommendation stated</b>  Operation Manual Manual Date: 11/97 Rev. C Page: 34	<b>Annual</b>	Off-site or IHG via water temperature bath and NIST thermometer for multiple point calibration
<b>Questemp II</b>  Model: <b>Personal Heat Stress Monitor</b>	Quest Technologies 510 Worthington Street Oconomowoc, WI 53066 Phone: (414) 567-9157 Phone: (800) 245-0779 FAX (414) 567-4047	Recommendation Reference: <b>Cal Probe</b> for ear/environment differential (internal electronic equilibrate) <b>before and after each use.</b>  Operation Manual Manual Date: 7/94 Rev. C Page: 11	<b>Annual</b>	Off-site or IHG via water temperature bath and NIST thermometer for multiple point calibration
			<b>Before and After each use</b>	Internal electronic equilibrate cycle in meter operation
<b>Protimeter Moisture Indicator</b>  Model: <i>SurveyMaster SM</i>	<b>GE Protimeter PLC</b> <b>Meter House</b> <b>Marlow</b> <b>Bucks SL7 1LW England</b> <b>(800) 321-4878</b> <b>www.protimeter.com</b>	Recommendation Reference: <b>Calibrate with the “Protimeter Check” test device before each use.</b>  Operation Manual Manual Date: May 2002 Page: 10	<b>Before each use</b>	n/a



## V. Noise Meters

Meter	Manufacturer &Address/Phone	Manufacturer Calibration Frequency Recommendation	BNL Calibration Frequency Policy	BNL Calibration Mechanism
<b>Quest Noise Dosimeter</b>  Model: <b>Quest Q-300 Noise Dosimeter</b>	Quest Electronics 510 Worthington Street Oconomowoc, WI 53066 Phone: (414) 567-9157 Phone: (800) 245-0779 FAX (414) 567-4047	Recommendation Reference: <b>Yearly- factory check out</b> <b>Prior to use with Calibrator</b>  Operation Manual Manual Date: 2/2000 rev. H Page: 5	<b>Annual</b>	Off-site maintenance check and calibration
			<b>Prior to each use</b>	IHG field calibrator, single point at 1000 Hz, A-weighted
<b>Quest Acoustic Calibrator</b>  Model: <b>QC-10/ QC-20</b>	Quest Electronics 510 Worthington Street Oconomowoc, WI 53066 Phone: (414) 567-9157 Phone: (800) 245-0779 FAX (414) 567-4047	Recommendation Reference: <b>Not stated</b>  Operation Manual Manual Date: 2/2000 rev. H Page: 4-5	<b>Annual</b>	Off-site
<b>GenRad Octave Band Analyzer</b>  Model: <b>GenRad 1982</b>			<b>Annual</b>	IHG field calibrator multiple frequency calibration Flat weighted, off-site vendor if fails
			<b>Prior to and after each use</b>	IHG field calibrator, single point at 1000 Hz A-weighted for SPL
			<b>Prior to and after each use</b>	IHG field calibrator, single point at 62- 4000 Hz for OBA
<b>GenRad Calibrator</b>  Model: GR1562-A	General Radio Quad Tech	Recommendation Reference: <b>No recommended frequency</b>  Operation Manual Manual Date: 4/78 Page: 38	<b>Annual</b>	Off-site Vendor
<b>B&amp;K Precision Integrating Sound Level Meter</b>  Model: <b>Type 2236</b>	Bruel & Kjaer Instruments, Inc. 185 Forest Street Marlborough, MA 01752-3093 Phone: (508) 481-7737 FAX (508) 624-0503	Recommendation Reference: <b>No Recommendation stated</b>  Operation Manual Manual Date: Oct., 1993 Page: 7-1	<b>Annual</b>	IHG field calibrator multiple frequency calibration Flat weighted, off-site vendor if fails
			<b>Prior to and after each use</b>	IHG field calibrator, single point at 1000 Hz A-weighted for SPL
			<b>Prior to and after each use</b>	IHG field calibrator, single point at 62- 4000 Hz for OBA

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**Date: 12/13/2004 (12)**

<b>Meter</b>	<b>Manufacturer &amp;Address/Phone</b>	<b>Manufacturer Calibration Frequency Recommendation</b>	<b>BNL Calibration Frequency Policy</b>	<b>BNL Calibration Mechanism</b>
<b>B&amp;K Calibrator</b>  Model: 4231	Bruel & Kjaer Instruments, Inc. 185 Forest Street Marlborough, MA 01752-3093 Phone: (508) 481-7737 FAX (508) 624-0503	Recommendation Reference: <b>Annual as per ANSI S1.40</b>  Operation Manual Manual Date: 1/94 Page: 3-4		
<b>Casella Digital Impulse Sound Level Meter</b>  Model: CEL-254	Casella CEL Tech Park, 17 Old Nashua Road, Box 15 Amherst NH 03031 (800) 366-2966	Recommendation Reference: <b>Use CEL-282 before and after use. Recommended that the calibration be verified at least annually.</b>  Operation Manual Manual Date: 060064, issue 8, Jan 02 Page: 2 & 3	<b>Annual</b>	Off-site Vendor
			<b>Prior to and after each use</b>	IHG field calibrator, single point
<b>Casella Acoustical Calibrator</b>  Model: CEL-282	Casella CEL Tech Park, 17 Old Nashua Road, Box 15 Amherst NH 03031 (800) 366-2966	Recommendation Reference: Recommend including calibrator in factory maintenance agreement to extend warranty.  Operation Manual Manual Date: 060050, Issue 4; Aug 1999 Page: last page of tri-fold instructions	<b>Annual</b>	Off-site Vendor
<b>Extech Real Time Octave Band Analyzer</b>  <b>Model 407766</b>	Extech Instruments (781) 890-7440 www.extech.com	Recommendation Reference: <b>Recommended recalibration on an annual basis</b>  Operation Manual Manual Date: Ver 2.0 October 2001 Page: 4 of 4	<b>Annual</b>	Off-site Vendor
			<b>Prior to and after each use</b>	IHG field calibrator, single point at 1000 Hz A-weighted for SPL
			<b>Prior to and after each use</b>	IHG field calibrator, single point at 62- 4000 Hz for OBA

**IH51660 Attachment 9.1 BNL Instrument Calibration Frequency Policy****Date: 12/13/2004 (13)**

<b>Meter</b>	<b>Manufacturer &amp;Address/Phone</b>	<b>Manufacturer Calibration Frequency Recommendation</b>	<b>BNL Calibration Frequency Policy</b>	<b>BNL Calibration Mechanism</b>
<b>Extech Acoustic Calibrator</b>  <b>Model 407766</b>	Extech Instruments (781) 890-7440 www.extech.com	Recommendation Reference: <b>Recommended recalibration on an annual basis</b>  Operation Manual Manual Date: Ver 2.0 October 2001 Page: 4 of 4	<b>Annual</b>	Off-site Vendor